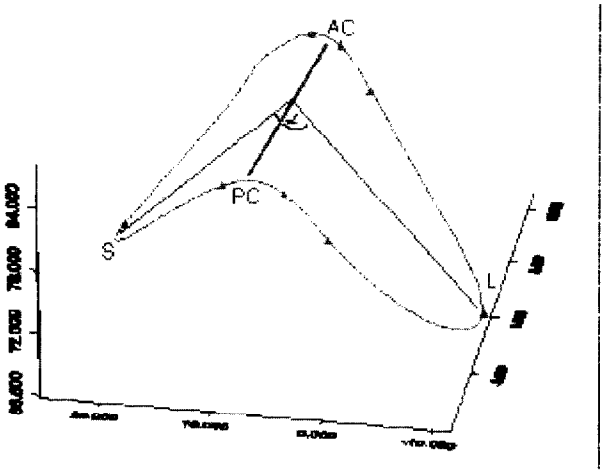
9:45 a.m.

801FO-3 **Determination of Mitral Annular 3-D Geometry From Real-Time 3-D Echocardiography: An In-Vitro Validation and Clinical Study**

Giuseppe Saracino, Takahiro Shiota, Qin Jian Xin Qin, Neil Greenberg, James D. Thomas, The Cleveland Clinic Foundation, Cleveland, OH

The 3D geometry of mitral annulus (MA) is known to be related to valve function. Real-time 3D echocardiography (RT3DE) potentially enables noninvasive evaluation of annular geometry. In this study, we propose a novel semi-automatic method for the assessment of MA geometry and apply this technique to examine differences between normal and prolapsing valves. **Methods:** Five saddle shaped MA phantoms with known angles (α: 85 to 160°) between the vectors from septal (S) and lateral (L) points to the center of the inter-commisural line (see figure) were imaged by RT3DE. Eight annular points were identified manually using customized visualization and analysis software. The shape of the MA phantom was reconstructed using an automated algorithm based on Fourier analysis and parameters including the angle, α, were automatically derived. This technique was applied in six normal subjects and in six patients with mitral valve prolapse (MVP) and severe mitral regurgitation. **Results**: A strong relationship between the estimated and actual angle of the MA phantoms studied in vitro was observed (y=0.99x+1.5, r=0.87, p<0.001). In the clinical study, the MA angle in MVP patients was significantly larger than for normals (143±5.6 vs 126±3.5°, p<0.05). Time required to process the RT3DE data and obtain the angle was less than a minute. **Conclusion**: This new computerized semi-automatic method can determine unique 3D descriptors of MA geometry that may provide information about pathophysiologic changes in patients with MVP.



10:00 a.m.

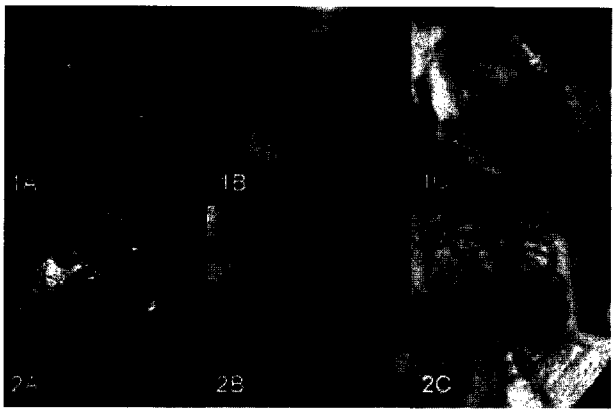
801FO-4 **Comparison of 2-D Intracardiac and Transesophageal Echocardiography and Fluoroscopy to 3-D Echocardiography in Sizing Atrial Septal Defect for Percutaneous Device Closure**

Zheng Liu, Satish Surabhi, Bassam Roukoz, Tammana Nahar, Timothy Puri, Sheldon Goldberg, Mani A. Vannan, Daniel McCormick, Drexel University College of Medicine, Philadelphia, PA

Background: Sizing Atrial Septal Defects (ASD) is essential for the selection of optimal Amplatzer occlusion device (AOD) during percutaneous closure. We compared the ASD diameter by transesophageal echo (TEE), intracardiac echo (ICE) and fluoroscopy to maximal 3-D Echo dimension of ASDs.

Methods: 18 patients with secundum ASD underwent AOD closure. 2-D TEE and maximal 3-D TEE (Fig. 1C) unstretched diameter (USD) were measured. During the AOD closure, ICE USD and balloon stretched diameter (BSD) by both ICE (Fig. 1A) and fluoroscopy (Fig. 1B) were measured. **Results** (mm, mean±SD) were: 3-D TEE USD (21.4±7.2), fluoroscopic BSD (18.2±7.2), ICE BSD (17.7±6.3), ICE USD (13.2±6.5) and 2-D TEE USD (12.5±7.9). 3-D TEE USD was marginally larger than fluoroscopic BSD (p=0.042) and significantly larger than ICE BSD, ICE USD and 2-D TEE (p<0.001). Fluoroscopic BSD was not significantly different from ICE BSD (p=0.16). Also, fluoroscopic BSD correlated well with ICE BSD and 3-D TEE (r=0.96 for both). In 2 cases where 3-DE USD was 4-6 mm larger than fluoroscopic BSD, the defects were irregular and non-uniform (Fig. 2A-2C).

Conclusions: ICE and fluoroscopy are comparable in sizing symmterical ASDs. But fluoroscopy may not yield the largest diameter in non-uniform and complex ASDs . This is because balloon stretch deformation transforms an asymmterical, ASD into an uniform shaped defect with a smaller maximal fluoroscopic BSD.Thus, 3DE TEE USD represents the best method to measure maximal diameter in asymmetrical ASDs .



10:15 a.m.

801FO-5 **Initial Experience With a New Real-Time 3-D Ultrasound Imager: Comparison With Conventional Echocardiographic Methods**

Kumiko Hirata, Yumiko Miyake, Kenichi Sugioka, Marco Di Tullio, Shunnichi Homma, Shunnichi Homma, Columbia University, New York, NY

Background: The aim of this study was to explore the clinical value of a newly developed transthoracic real-time 3-dimensional (RT3D) echocardiography compared with conventional transthoracic and transesophageal echocardiography. This is the first ever report of clinical use of this new modality. **Methods:** We examined 22 patients (3 myocardial infarction, 13 mitral regurgitation, 2 mitral stenosis, 2 aortic stenosis and 2 aortic regurgitation) using RT3D as well as with conventional transthoracic, and transesophageal echocardiography (All from Phillips Medical Systems, Andover, Mass.). We evaluated left ventricular wall motion, aortic valve and mitral apparatus. These structures were all contained within the same 3D volume and displayed in a 3D-rendered format in real-time that could be manipulated to demonstrate any plane within this volume. **Results:** In patients with myocardial infarction, the estimation of wall motion abnormality from RT3D showed excellent concordance with those seen by the conventional methods. In patients with mitral valve disease, RT3D provided an accurate information regarding prolapsed portion, calcified lesion and malcoaptation points. Images were significantly easier to interpret compared to the conventional methods. However, in patients with aortic valve diseases, it was not always possible to obtain adequate images for evaluation of its anatomical features. **Conclusions:** New RT3D echocardiography provides accurate information regarding ventricular wall motion, and appears to be especially promising for evaluation of mitral valvular morphology.

ORAL CONTRIBUTIONS

802 Contrast Echocardiography: Targeting Microbubbles

Monday, March 31, 2003, 9:15 a.m.-10:30 a.m.
McCormick Place, Grand Ballroom S100 BC

9:15 a.m.

802-1 **Noninvasive Assessment of Angiogenesis by Contrast Ultrasound Imaging With Microbubbles Targeted to Alpha-V Integrins**

Howard Leong-Poi, Jonathan P. Christiansen, Alexander L. Klibanov, Sanjiv Kaul, Jonathan R. Lindner, University of Virginia, Charlottesville, VA

Non-invasive methods for assessing angiogenesis in ischemic tissues are lacking. We hypothesized angiogenesis in ischemic tissues could be assessed using contrast-enhanced ultrasound (CEU) with microbubbles targeted for endothelial α_v-integrins expressed in neovessels.

Microbubbles targeted to α_v integrins (MB_E) were prepared by conjugating the disintegrin echistatin to their surface. Intravital microscopy revealed retention of MB_E but not control microbubbles to FGF-2-treated cremaster muscles. Preferential retention of MB_E microbubbles was also found during CEU imaging of a matrigel plug model of angiogenesis in mice. The ability to assess angiogenic responses to chronic ischemia with α_v-targeted microbubbles was tested in an ischemic hindlimb model produced by common iliac artery ligation in 16 rats. The proximal adductor muscles of the ischemic and contralateral control hindlimb were studied at 1 hr (in all animals), and at 4, 7, 14, and 28 days (n=4 for each). CEU perfusion imaging with non-targeted microbubbles, and targeted imaging of angiogenesis with MB_E were performed. Tissue PO_2 was measured by phosphorescence quenching. One hour after ligation, the normalized microvascular blood flow (0.31±0.11) and microvascular blood volume (0.56±0.13) for the ischemic muscle were low. MB_E signal intensity in ischemic muscle, normalized to microvascular blood